

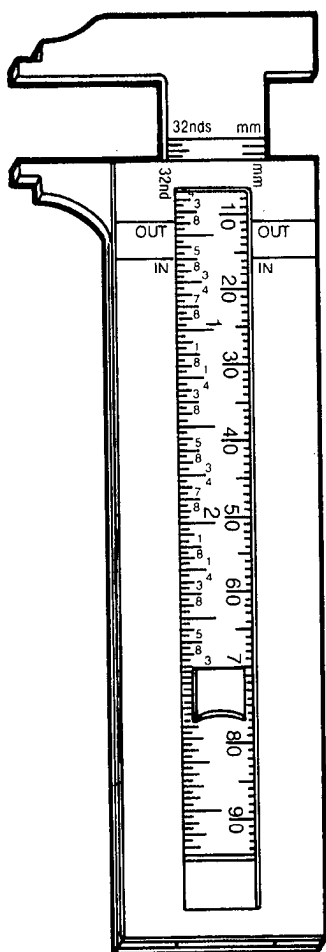
## Chapter 6 CALIPERS

### HOW TO CHOOSE AND USE THEM

The "Types and Uses" section provides you with a list of types of calipers. These pages should help you select the right calipers for the job.

The "Reading Calipers" section tells you how to read special calipers for accurate measurements. By becoming familiar with this procedure, you will learn to make accurate measurements. The "Care" pages tell you how to keep your calipers in good condition.

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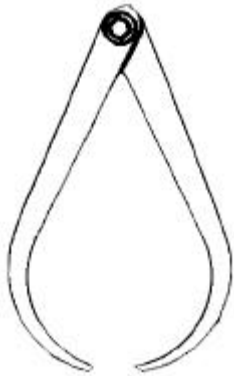


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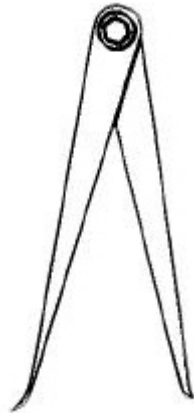
## TYPES AND USES

Calipers are used to measure diameters. Outside calipers measure outside diameters. Inside calipers measure inside diameters. Simple calipers are used along with a scale to find the measurement. Slide calipers and vernier calipers have their own scales.

### SIMPLE CALIPERS



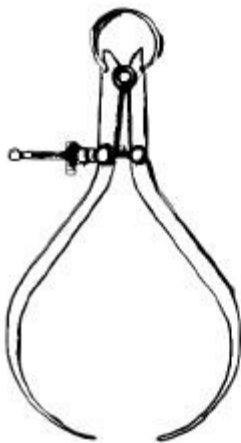
OUTSIDE CALIPERS



INSIDE CALIPERS

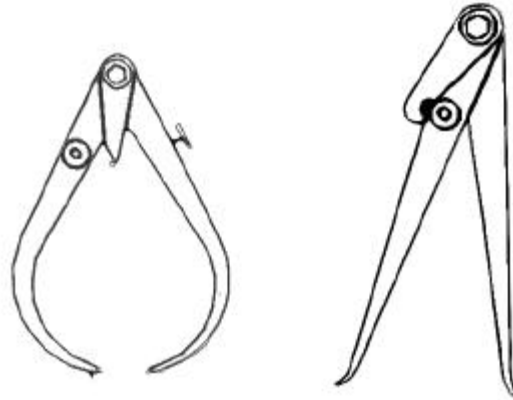
The simple outside calipers are bowlegged. Those used for inside diameters have straight legs with feet turned outward. Calipers are adjusted by pulling or pushing the legs to open or close them.

### SPRING-JOINT CALIPERS



The spring-joint calipers have the same type of legs, but are joined by a strong spring hinge, screw, and adjustment nut.

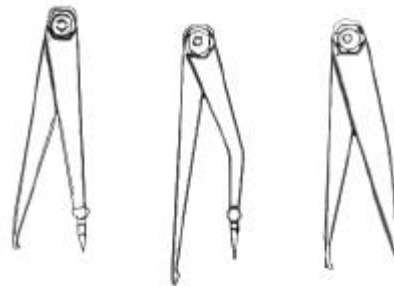
### TRANSFER CALIPERS



Transfer calipers are used for measuring chamfered grooves or flanges. A screw attaches a small auxiliary leaf to one of the legs.

The measurement is made as with ordinary calipers. The leaf is locked to the leg. The legs may be opened or closed as needed to clear the obstruction. The legs are then brought back and locked to the leaf, restoring them to the original setting.

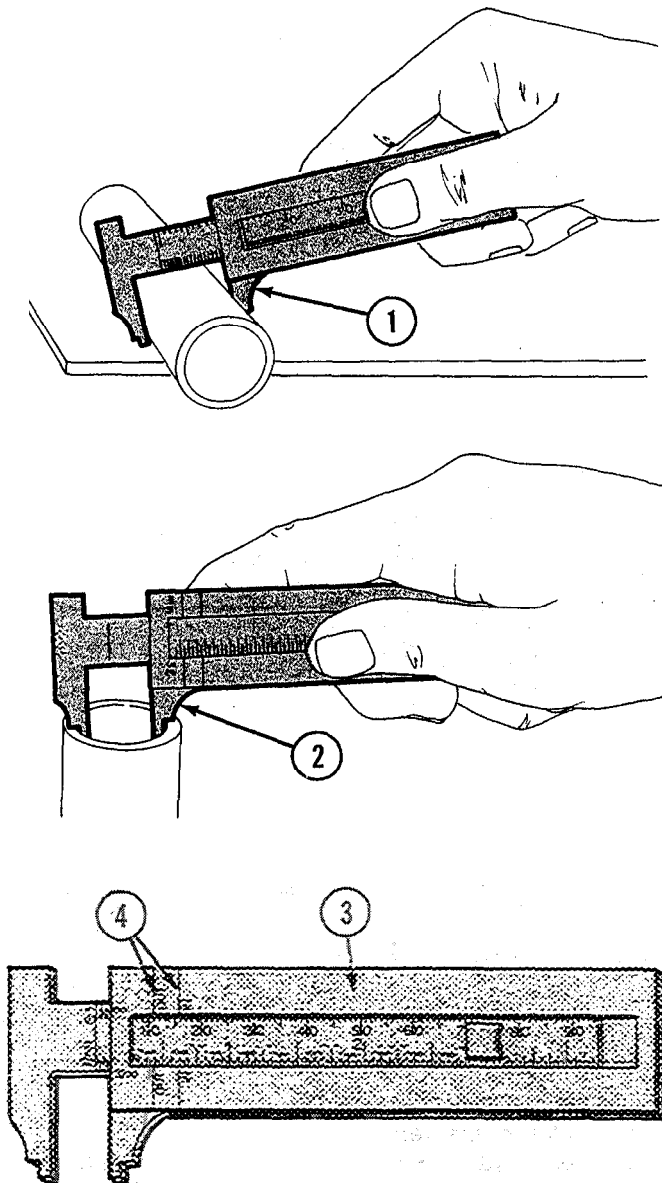
### HERMAPHRODITE CALIPERS



The hermaphrodite calipers have one straight leg ending in a sharp point. On some models this point is removable. This leg is usually bowlegged. This caliper is used for finding shaft centers or locating shoulders.

## TYPES AND USES - Continued

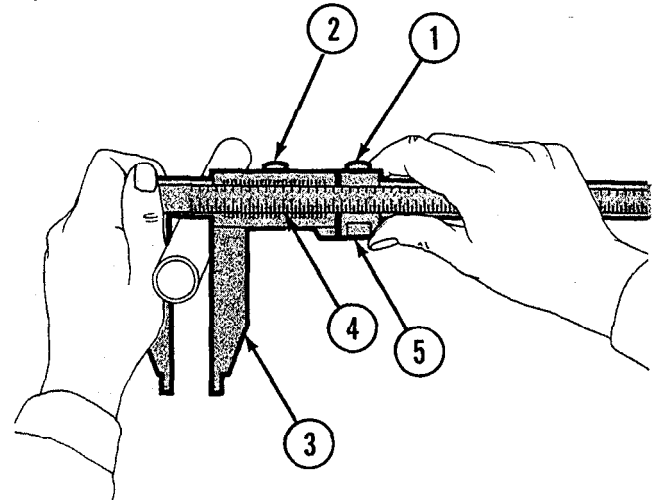
### SLIDE CALIPERS



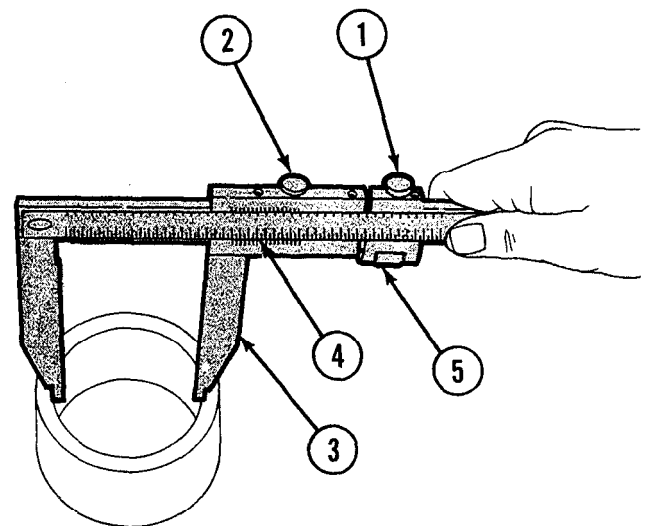
Slide calipers can be used for measuring outside and inside dimensions. Graduations are in inches, fractions, or millimeters. As shown above, one side of the caliper is used to measure outside (1) and the other side is used to measure inside (2) dimensions. Stamped on the frame (3) are the words "IN": and "OUT" (4). You use them when taking inside and outside measurements. The other side of the caliper is used as a straight measuring rule. If necessary, see chapter 3 of this manual for reading scales and rules.

### VERNIER CALIPERS

#### OUTSIDE



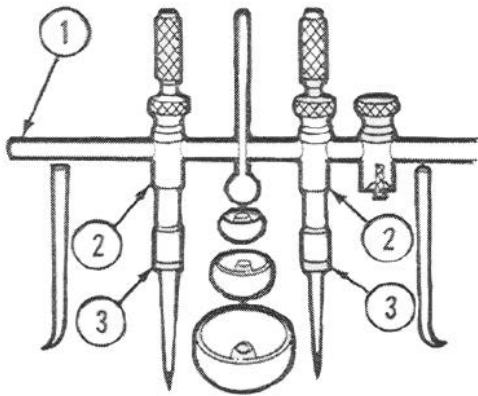
#### INSIDE



Vernier calipers work like slide calipers. As shown above, vernier calipers can make very accurate outside or inside measurements. A vernier caliper is used by loosening the two locking screws (1) and (2). This allows the movable jaw (3) to move along the rule until desired position is obtained. The locking screw (1) is then retightened securing the movable jaw (3). Any fine adjustments to the vernier scale (4) are then made using adjustment control (5). Locking screw (2) is then secured and vernier caliper is ready to read.

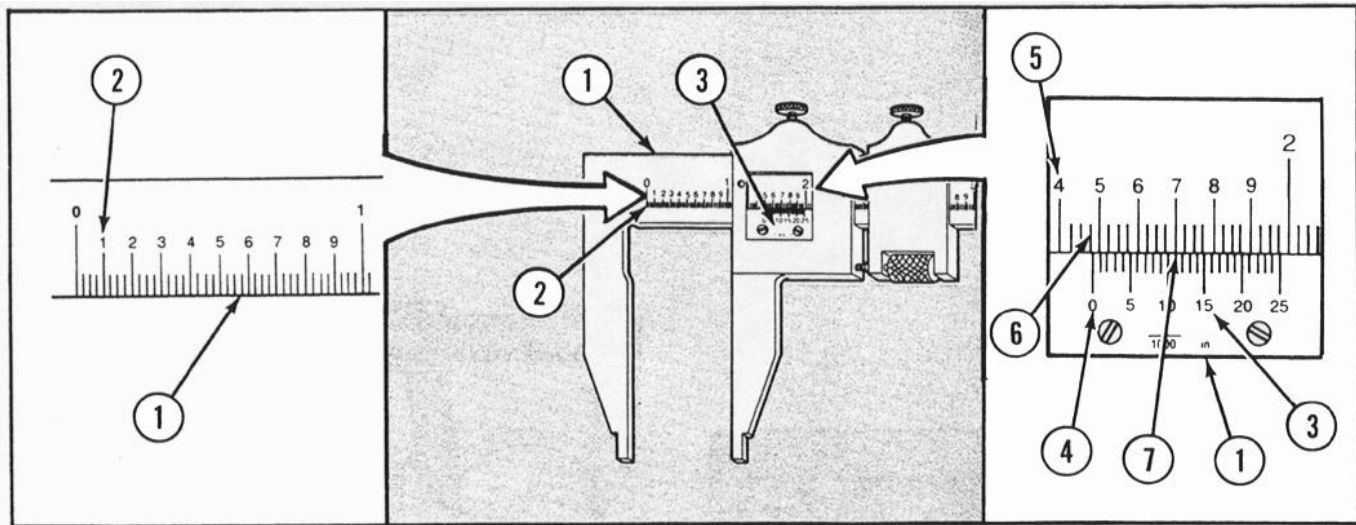
## TYPES AND USES - Continued

### TRAMMELS



The trammel measures distances beyond the range of calipers. The instrument consists of a rod or beam (1) to which trams (2) are clamped. The trams (2) carry chucks (3). The trammel can also be used as a divider by changing the points.

## READING A VERNIER CALIPER



To read a vernier caliper, you must be able to understand both the steel rule and vernier scales. The steel rule (1) is graduated in 0.025 of an inch. Every fourth division (2) (representing a tenth of an inch) is numbered.

The vernier scale (3) is divided into 25 parts and numbered 0, 5, 10, 15, 20, and 25. These 25 parts are equal to 24 parts on the steel rule (1). The difference between the width of one of the 25 spaces on the vernier scale (3) and one of the 24 spaces on the steel rule (1) is 1/1000 of an inch.

Read the measurement as shown above.

Read the number of whole inches on the top scale (1) to the left of the vernier zero index (4) and record . . . . . 1.000 inch

Read the number of tenths (5) to the left of the vernier zero index (4) and record . . . . . 0.400 inch

Read the number of twenty-fifths (6) between the tenths mark (5) and the zero index (4) and record . . . . . 3 x .025 = .075 inch

Read the highest line on the vernier scale (3) which lines up with the lines on the top scale (7) and record. (Remember 1/25 = .001 inch) . . . . . 11/25 or 0.011 inch

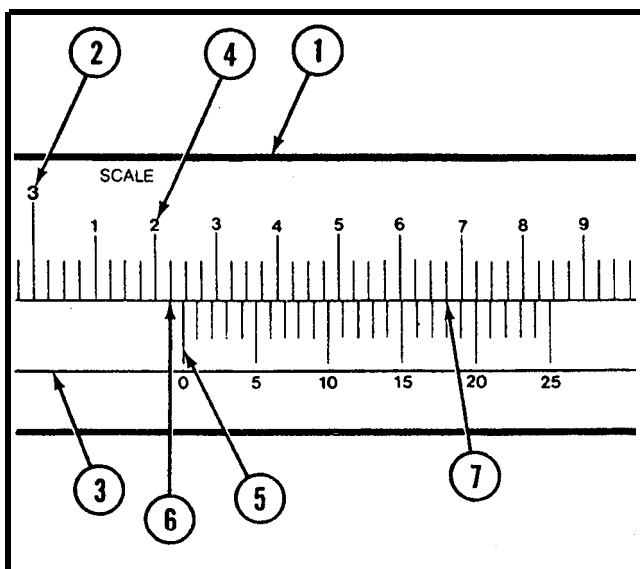
TOTAL 1.486 inches

## READING A VERNIER CALIPER - Continued

Most vernier calipers read "OUTSIDE" on one side and "INSIDE" on the other side. If a scale isn't marked, and you want to take an inside measurement, read the scale as you would for an outside diameter. Then add the measuring point allowance by referring to manufacturer's instructions or the following table.

Size of Caliper	English Measure	Metric Measure
6 inch or 150 mm	Add 0.250 inch	Add 6.35 mm
12 inch or 300 mm	.300 inch	7.62 mm
24 inch or 600 mm	.300 inch	7.62 mm
36 inch or 600 mm	.500 inch	12.70 mm

### READING A METRIC CALIPER



The steel rule (1) is divided into centimeters (cm) (2) and the longest lines represent 10 millimeters each. Each millimeter is divided into quarters.

The vernier scale (3) is divided into 25 parts and is numbered 0, 5, 10, 15, 20 and 25.

Read the total number of millimeters (4) to the left of the vernier zero index (5) and record .....32.00 mm

Read the number of quarters (6) between the millimeter mark and the zero index and record .....25 mm = (1 quarter)

Read the highest line on the vernier scale (3) which lines up with the line on the scale (7) and record .....18 mm  
TOTAL 32.43 mm

### CARE OF CALIPERS

1. Store calipers in separate containers provided.
2. Keep graduations and markings on all calipers clean and legible.
3. Do not drop any caliper. Small nicks or scratches can cause inaccurate measurements.
4. Protect caliper points from damage.

